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SELECTION OF LUBRICATING AND COOLING LIQUIDS FOR METALWORKING

Lubricating and cooling liquids are selected on the basis of the type of cutting, the required quality and type of the final work, the properties of the material, the type of equipment, and other factors. The selection can be made on the basis of data in the tables which follow.

Table 1. Lubricating and Cooling Liquids for the Cold Working of Ferrous Metals

Type of Operation	Name of Liquid	Composition of Liquid (percent content of chemicals in aqueous solution)
Rough Turning	Soda solution (sodovaya voda)	1 % of calcined soda or 0.8% of calcined soda and 0.25% of sodium nitrite
Preliminary milling	Alkaline phosphate water	1.5% of trisodium phosphate or 0.8% of trisodium phosphate and 0.25% of sodium nitrite
Drilling with the ratio of the length of the hole to the diameter of the drill ≤ 3	Aqueous solution of sodium silicate /literally, "liquid glass"/	0.8% of sodium silicate or 0.5% of calcined soda and 0.25% of sodium silicate
Grinding	Emulsion	1.2% "emul'sol" or paste and 0.5-0.8% of calcined soda (or trisodium phosphate) or 2% of "emul'sol" or paste and 0.25% of sodium nitrite

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Table 1 (Contd)

Type of Operation	Name of Liquid	Composition of Liquid (percent content of chemicals in aqueous solution)
Fine turning; final milling	Soap solution	0.5-0.75% of calcined soda or trisodium phosphate, 0.5-1.0% of soap, and 0.25% of sodium nitrite
Drilling with the ratio of the length of the hole to the diameter of the drill between 3 and 5	Emulsion	3-4% of "emul'sol" or paste and 0.5% of calcined soda or trisodium phosphate or of sodium silicate
Drilling of deep holes	"Sul'fofrezol" with the addition of kerosene	90% of sul'fofrezol and 10% of kerosene
Reaming and broaching	Emulsion	5% of emul'sol and 0.2% of calcined soda or of trisodium phosphate or of sodium silicate
Reaming of deep holes	Sul'fofrezol	78-80% of mineral oil, 18-20% of nigrol, and 1.7-2% of sulfur. Any mineral oil, including used oil, may fulfill the function of the mineral constituent. Heating mazut may fulfill the function of nigrol.
Gear slotting	Sul'fofrezol	Same as above.
Gear milling; thread milling	Emulsion	10-20% of emul'sol and 0.1% of calcined soda or of trisodium phosphate
Working on automatic machine tools	Emulsion	15-20% of emul'sol and 0.1% of calcined soda or of trisodium phosphate

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Table 2. Lubricating and Cooling Liquids for the Cold Working of Nonferrous Metals

Type of Machining	Name of Liquid	Material Being Worked*						
		Brass	Bronze	Copper	Aluminum	Duralumin	Silumin	Electron metal
Roughing	Emulsion	+	+	+ –	+	Dry	+	+
Boring	Rapeseed oil	+	+	–	–	+	–	–
	Emulsion	–	–	+	–	–	–	–
	56% of kerosene and 44% of turpentine	–	–	–	+	–	+	–
Fine turning	Kerosene	Dry	Dry	Dry	+	+	–	Dry
	Rapeseed oil	–	–	–	–	–	+	–
Threading	Rapeseed oil	+	+	+	–	+	–	Dry
	Kerosene	–	–	–	+	–	+	–
Drilling	Emulsion	+	+	+	+	+	+	–
	Rapeseed oil	–	–	+	–	–	–	–
Reaming	Rapeseed oil	+	+	–	–	+	–	Dry
	Emulsion	–	–	+	–	–	–	–
	56% of kerosene and 44% of turpentine	–	–	–	+	–	+	–
Rough milling	Emulsion	+	+	+	+	–	+	+
	Rapeseed oil	–	–	–	–	+	–	–
Final milling	Emulsion	+	Dry	+	Dry	–	+	Dry
	Rapeseed oil	–	–	–	–	+	–	–
Grinding	Emulsion	+	+	+	–	–	Dry	+
	50% of machine oil and 50% of kerosene	+	+	–	+	+	–	–

* A plus sign indicates that the liquid in question is recommended for use; a minus sign, that it is not recommended. "Dry" indicates that the metal is worked without cooling, i. e., in a dry state. To prevent ignition of the metal, electron metal is never ground without a cooling liquid.

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Table 3. Average Normal Expenditure of Lubricating and Cooling Liquids in Different Types of Metalworking

Type of Operation	Name of Liquid	Quantity of Liquid Supplied per Tool (liters/min)	Expenditure of Liquid per Machine Tool (liters/mo)
Turning			
Rough	Emulsion	Up to 20	100
Final	"	Up to 10	80
Milling			
Rough	"	Up to 20	100
Final	"	Up to 10	60
Extra-fine	Sul'fofrezol	10-20	40
Of threads	"	Up to 6	20
Threading	"	Up to 3	10
Gear cutting			
Rough	"	Up to 10	40
Final	"	Up to 4	10
Broaching			
Rough	"	Up to 15	10
Final	"	Up to 10	10
Grinding			
Rough	Soda solution	Up to 30	250
Final	Emulsion	Up to 30	200
Extra-fine	"	Up to 30	200
Drilling	"	Up to 6	50

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